the antenna is retracted and the portable radio terminal is in transmit mode;

the antenna is extracted and the portable radio terminal is in receive mode; and

the antenna is extracted and the portable radio terminal is in transmit mode.

68. (New) A method of matching the impedance between an antenna and a portable radio terminal, the radio including transmitting and receiving circuits and an impedance matching system for matching an impedance of an antenna and an impedance of said radio, said method comprising:

sensing whether the portable radio terminal is transmitting or receiving;

determining an optimum control voltage value to match the impedances based on whether the portable radio terminal is transmitting or receiving; and

storing a digital value representing said optimum control voltage value in a memory location in said impedance matching system.

69. (New) The method of claim 68, wherein said determining and storing steps are performed when the portable radio terminal is receiving and when the portable radio terminal is transmitting.

70. (New) The method as claimed in claim 68, wherein the transmit impedance is matched for a first frequency and the receive impedance is matched for a second frequency.--

REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the subject application. The Office Action of January 2, 2003, has been received and its

contents carefully reviewed. Claims 1-38 are pending in the present application, with claims 39-70 having been added by this Amendment.

In the Office Action dated January 2, 2003, claims 22-31, 22-36 and 38 are objected to due to improper dependency; claims 1, 3-4, 7, 9-11, 15-16, 21, and 26-36 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,335,368 to Tamura (hereinafter "Tamura") in view of U.S. Patent No. 6,211,830 to Monma et al. (hereinafter "Monma"); claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of U.S. Patent No. 6,438,392 to Toba (hereinafter "Toba"); claims 5, 8, 12-14, 17-20, 22-25, and 37-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of U.S. Patent No. 6,219,532 to Tanaka et al. (hereinafter "Tanaka") and in further view of U.S. Patent No. 6,198,441 to Okabe et al. (hereinafter "Okabe"); and claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Monma and further in view of U.S. Patent No. 6,459,398 to Gureshnik (hereinafter "Gureshnik").

In the Office Action dated January 2, 2003, claims 22-31, 22-36 and 38 are objected to due to improper dependency. Claims 22-38 have been corrected accordingly.

In the Office Action dated January 2, 2003, claims 1, 3-4, 7, 9-11, 15-16, 21, and 26-36 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Monma. The rejection of claims 1, 3-4, 7, 9-11, 15-16, 21, and 26-36 is respectfully traversed and reconsideration is requested.

Regarding the rejection of claims 1, 3-4, 11, 15-16, 21, and 26-31, Applicant respectfully asserts that the Office Action fails to provide a motivation to combine the cited

references to establish *prima facie* obviousness. The Manual of Patent Examining Procedure ("MPEP"), citing In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990) states:

> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. MPEP 2143.

Moreover, although a device may be capable or being modified, there must be some suggestion or motivation in the references. MPEP 2143. Furthermore, if the suggested combination of references requires a substantial restructuring or redesign of the primary reference and a change in the basic principle of operation of the primary reference, then there can be no motivation to combine. MPEP 2143, citing In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959). It must first be shown that there is some suggestion or motivation to combine the references cited, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art to modify the reference or to combine the references teachings. MPEP 2143.

The Office Action suggests that the motivation to combine Tamura and Monma would have been "to prolong the life of the portable phone by replacing the mechanical switch with electronic means."

Applicant respectfully submits that this recitation of motivation fails to explain what specific scientific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination of Tamura and Monma.

In addition, Applicant submits that at least the Tamura and Monma references, which are the only references cited to reject independent claims 1, 11, and 21 are non-analogous, *i.e.*, that the references are not within the field of the inventor's endeavor.

Specifically, the objective of the invention in Tamura is to mitigate the effect whereby "when the antenna matching is established when the apparatus is in the folded state, there arises a problem ... that the effecting receiving sensitivity and the effective transmitting radiation power are decreased in the operating, i.e. unfolded state." See col. 1, lines 56-61. To the contrary, Monma describes the deficiency in background art as follows

> The conventional radio antenna apparatus ... has the same horizontal plane directivity pattern in the x-y plane and hence a horizontal plane non-directivity pattern. Therefore, in a case where a human head or like obstacle approaching the microphone exists in proximity to the radio set comprising the conventional radio antenna apparatus described above, the radio wave is interrupted by the obstacle, and this leads to a gain deterioration. The solution proposed by Monma is to "provide a radio antenna apparatus, in which the horizontal plane directivity pattern of the antenna is changed in a direction not affected by an obstacle."

Therefore, because the problems addresses by Tamura and Monma are different. Applicant asserts that one of ordinary skill would not have reasonably consulted these references and applied their teachings in seeking a solution to the problem that the present invention attempts to solve. See, In re GPAC, 57 F.3d 1573, 1578, 35 USPQ2d 1116 (Fed. Cir. 1995)(citing In re Wood, 599 F. 2d 1032, 1036, 202 USPQ 171 (CCPA 1979)).

Applicant respectfully requests reconsideration of the claims 1, 3-4, 11, 15-16, 21, and 26-31, which are rejected over the combination of Tamura and Monma, because there is no motivation to combine these references, particularly because the fields of endeavor and the problems to be solved by Tamura and Monma are not analogous.

Examiner rejects claims 7, 9, and 10 under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Monma. The rejection of claim 7 is respectfully traversed and reconsideration is requested. Independent claim 7, as amended, is allowable over the cited references in that this claim recites a combination of elements including, for example, "means for sensing whether the portable radio telephone is in transmit mode or receive mode and in response thereto providing a sensing signal," and "means for matching an impedance of the antenna and an impedance of the transmission/reception circuit according to the control voltage from the controller, wherein the impedance is matched based on whether the portable radio telephone is receiving as opposed to when it is transmitting." Nothing in the cited references, including Tamura or Monma, teaches or suggests at least this feature of the claimed invention. To the contrary, in the system disclosed by Tamura, "when the sensing means senses the folded state of the casing, the variable matching means changes the matching state between the radio circuit and the antenna in association with the contour of the casing." See col. 2, lines 34-38 of Tamura. Monma teaches a system whereby "[t]he short-circuited state between the contacts ... is detected by the antenna position detecting unit, and the detection signal is outputted to the controller. In response thereto, the controller switches over both of the switches ... controlling the horizontal plane directivity pattern." See col. 11, lines 15-23. Accordingly, Applicant respectfully submits that claim 7 and claims 9-10, which depend from claim 7, are allowable over the cited references.

Examiner rejects claims 32-36 under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Monma. The rejection of claim 32 is respectfully traversed and reconsideration is requested. Independent claim 32, as amended, is allowable over the cited references in that this claim recites a combination of elements including, for example, "a sensor for sensing whether the portable radio terminal is in transmit mode or receive mode

and for producing at least one sensing signal indicating whether the portable radio terminal is in transmit mode or receive mode" and "an impedance matching system for matching an impedance of said antenna and an impedance of said radio, said impedance matching system receiving the sensing signal and including an impedance matching circuit having a varactor, the varactor having a varactor voltage which is changed in response to the sensing signal for tuning the impedance matching circuit based on whether the radio is transmitting or receiving." Nothing in the cited references, Tamura or Monma, teaches or suggests at least this feature of the claimed invention. To the contrary, in the system disclosed by Tamura, "when the sensing means senses the folded state of the casing, the variable matching means changes the matching state between the radio circuit and the antenna in association with the contour of the casing." See col. 2, lines 34-38 of Tamura. Monma teaches a system whereby "[t]he short-circuited state between the contacts ... is detected by the antenna position detecting unit, and the detection signal is outputted to the controller. In response thereto, the controller switches over both of the switches ... controlling the horizontal plane directivity pattern." See col. 11, lines 15-23. However, nothing in either reference teaches or suggests "sensing whether the portable radio telephone is in transmit mode or receive mode." Accordingly, Applicant respectfully submits that claim 32 and claims 33-36, which depend from claim 32, are allowable over the cited references.

In the Office Action dated January 2, 2003, claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Toba. The rejection of claim 2 is respectfully traversed and reconsideration is requested. Claim 2, which depends from claim 1, is allowable over the cited references in that the claim recites "a matching circuit having a variable capacitance diode for matching the antenna impedance and an impedance of the transmission/reception circuit according to the voltage of the controller." Nothing in the

cited references, Tamura and Toba, teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 2 is allowable over the cited reference.

In the Office Action dated January 2, 2003, claims 5, 8, 17-20, 22-25, and 37-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Tanaka and in further view of Okabe.

The rejection of claim 5 is respectfully traversed and reconsideration is requested. Dependent claim 5 is allowable over the cited references in that the claim recites "a central processing unit (CPU) for reading the data from the memory according to a signal from the folder sensor." Nothing in the cited references, Tamura, Tanaka, or Okabe, teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 5 is allowable over the cited reference.

The rejection of claim 8 is respectfully traversed and reconsideration is requested. Dependent claim 8, as amended, is allowable over the cited references in that the claim recites "a central processing unit (CPU) for receiving the sensing signal and providing a digital voltage corresponding to the sensing signal, wherein the sensing signal indicates whether the portable radio telephone is in transmit mode or receive mode." Nothing in the cited references, Tamura, Tanaka, or Okabe, teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 8 is allowable over the cited reference.

The rejection of claims 12-14, which depend from claim 11, is respectfully traversed and reconsideration is requested. Dependent claim 12, as amended, is allowable over the

cited references in that claim 12 recites "a controller for receiving the sensing signal indicating whether the foldable casing is in the folded or unfolded position, wherein the controller provides a digital voltage corresponding to the sensing signal." Nothing in the cited references, Tamura, Tanaka, and Okabe teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 12 and claims 13-14, which depend from allowable claim 12, are allowable over the cited references.

The rejection of claims 17-20 is respectfully traversed and reconsideration is requested. Independent claim 17, as amended, is allowable over the cited references in that this claim recites a combination of elements including, for example "determining optimal antenna impedance matching values for transmitting and receiving, respectively, as well as the folder casing and antenna positions, and for storing the optimal impedance matching values." Nothing in the cited references, Tamura Tanaka, and Okabe teaches or suggests at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 17 and claims 18-20, which depend from claim 17, are allowable over the cited references.

Claims 22-25 are rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Tanaka and in further view of Okabe. The rejection of claims 22-25 is respectfully traversed and reconsideration is requested. Dependent claim 22, as amended, is allowable over the cited references in that claim recites "a processor which receives the sensing signal and outputs a digital control signal in response to whether the foldable casing is in the open position and whether the antenna is in the extended position." Nothing in the cited references, Tamura, Tanaka, and Okabe, teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 22 and claims 23-24,

which depend from claim 22 and claim 25, which depends from claim 24, are allowable over the cited references.

The rejection of claim 37-38 is respectfully traversed and reconsideration is requested. Independent claim 37, as amended, is allowable over the cited references in that this claim recites a combination of elements including, for example, "match[ing] the impedances based on the position of the casing, the position of the antenna, and whether the portable radio terminal is transmitting or receiving." Nothing in the cited references, Tamura, Tanaka, and Okabe teaches or suggests at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 37 and claim 38, which depends from claim 37, are allowable over the cited references.

In the Office Action dated January 2, 2003, claim 6 is rejected under 35 U.S.C. §103(a) as being unpatentable over Tamura in view of Monma and further in view of Gureshnik. The rejection of claim 6 is respectfully traversed and reconsideration is requested. Dependent claim 6, as amended, is allowable over the cited references in that the claim recites "a variable pulse generator for receiving a control signal and a data signal, which is based on the open state and the folded state of the folder casing, from the CPU and in response to the control signal varying one selected from the group consisting of pulse widths and pulse densities." Nothing in the cited references, Tamura, Monma, and Gureshnik, teaches at least this feature of the claimed invention. Accordingly, Applicant respectfully submits that claim 6 is allowable over the cited references.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

If the Examiner deems that a telephone call would further the prosecution of this application, the Examiner is invited to call the undersigned at (202) 496-7500. All correspondence should continue to be sent to the below-listed address.

If these papers are not considered timely filed by the Patent and Trademark Office, then a petition is hereby made under 37 C.F.R. §1.136, and any additional fees required under 37 C.F.R. §1.136 for any necessary extension of time, or any other fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911.

Dated: May 2, 2003

Respectfully submitted,

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Attachment: Claim Appendix

DC:120331.2

Version With Markings to Show Changes Made

1. A device for matching an antenna impedance in a portable radio telephone having a folder casing and a transmission/reception circuit, comprising:

a folder sensor for sensing a folded state and an unfolded state of the folder casing;

a controller for controlling a voltage according to the state sensed by the folder sensor; and[,]

a matching circuit having a variable capacitance diode for matching the antenna impedance and an impedance of the transmission/reception circuit according to the voltage of the controller.

4. A device as claimed in claim 1, wherein the matching circuit includes:

an inductor having a first end connected to the antenna and a second end connected to the transmission/reception circuit;

a first capacitor having a first end connected to the second end of the inductor and the transmission /reception circuit, and a second end grounded;

a second capacitor having a first end connected to the antenna and the <u>first</u> [second] end of the inductor, and having a second end connected to ground; and

a variable capacitance diode having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground,

wherein a capacitance of the variable capacitance diode is varied according to the voltage of the controller.

5. A device as claimed in claim 1, wherein the controller includes:

a memory for storing data for an optimal antenna impedance matching for the folded state and the opened state of the folder casing[,];

a central processing unit (CPU) for reading the data from the memory according to a signal from the folder sensor[,]; and

a digital-to-analog converter (DAC) for converting the [voltage] data from the CPU into an analog voltage and providing the analog voltage to the matching circuit.

6. A device as claimed in claim 5, wherein the DAC includes:

a variable pulse generator for receiving a control signal and a data signal, which is based on the open state and the folded state of the folder casing, from the CPU and in response [thereto] to the control signal varying one selected from the group consisting of pulse widths and pulse densities; and

an integrating circuit for integrating pulses received from the variable pulse generator and providing an integrated output signal to the matching circuit.

7. A device for matching an antenna impedance in a portable radio telephone having a transmission/reception circuit, [and an antenna movable between an extracted position from the telephone and a retracted position into the telephone;] comprising:

[means for sensing an extracted state and a retracted state of the antenna and in response thereto providing a sensing signal;]

means for sensing whether the portable radio telephone is in transmit mode or receive mode and in response thereto providing a sensing signal;

a controller for providing a control voltage in response to the sensing signal; and[,]

means for matching an impedance of the antenna and an impedance of the transmission/reception circuit according to the control voltage from the controller, wherein the impedance is matched based on whether the portable radio telephone is receiving as opposed to when it is transmitting.

8. A device as claimed in claim 7, wherein the controller includes[;]:

a central processing unit (CPU) for receiving the sensing signal and providing a digital voltage corresponding to the sensing signal, wherein the sensing signal indicates whether the portable radio telephone is in transmit mode or receive mode; and

a digital/analog [convertor] converter for receiving the digital voltage and converting the digital voltage into the control voltage and providing the control voltage to the means for matching the impedances.

10. A device as claimed in claim 7, wherein the means for matching the impedance includes[;]:

an inductor having a first end connected to the antenna and a second end connected to the transmission/reception circuit;

a first capacitor having a first end connected to the second end of the inductor and the transmission /reception circuit, and a second end grounded;

a second capacitor having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground; and

a variable capacitance diode having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground,

wherein a capacitance of the variable capacitance diode is varied according to the control voltage.

12. A device as claimed in claim 11, wherein the means for matching impedances includes:

a controller for receiving the sensing signal indicating whether the foldable casing is in the folded or unfolded position, wherein the controller provides [and providing] a digital voltage corresponding to the sensing signal;

a digital-to-analog [convertor] converter for converting the digital voltage into an analog voltage[,]; and

a matching circuit for matching an impedance of the antenna and an impedance of the transmission/receiving circuit in response to the analog voltage.

16. A device as claimed in claim 12, wherein the matching circuit includes:

an inductor having a first end connected to the antenna and a second end connected to the transmission/reception circuit;

a first capacitor having a first end connected to the second end of the inductor and the transmission /reception circuit, and a second end grounded;

a second capacitor having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground; and

a variable capacitance diode having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground,

wherein a capacitance of the variable capacitance diode is varied according to the analog voltage.

17. A device for matching an antenna impedance in a portable radio telephone [comprising] including a radio having transmission and receiving circuits, a foldable casing enclosing the radio, the foldable casing movable between an unfolded position and a folded position, and an antenna movable between an extracted position from the foldable casing and a retracted position into the foldable casing, the device comprising[;]:

means for sensing whether the foldable casing is in the unfolded position, and for sensing whether the antenna is in the extracted position, and for providing a sensing signal in response thereto;

a measurement device for providing a RF signal to the antenna[,] and for measuring an RF signal from the antenna;

a controller for controlling the measurement device to provide the RF signal to the antenna in a reception mode, and to measure the RF signal from the antenna in a transmission mode, and for determining optimal antenna impedance matching values for [respective] transmitting and receiving, respectively, [modes, and for] as well as the folder casing and antenna positions [and the antenna positions], and for storing the optimal impedance matching values; and[,]

means for adjusting an impedance match between the antenna and the radio in response to the sensing signal under the control of the controller for each folder casing position, antenna [impedance] position, and transmission and reception mode to vary an antenna impedance matching, the controller measuring a transmission level in the transmission mode and a reception sensitivity in the reception mode every time the antenna impedance matching is varied, to determine optimal antenna impedance matching values for

each folder casing position, antenna [impedance] position, and transmission and reception mode, and to store the optimal antenna impedance matching values therein.

18. A device as claimed in claim 17, wherein the means for adjusting the impedance match includes[;]:

a central processing unit (CPU) adjusting a voltage by a fixed increment from 0V to a fixed voltage level in response to the sensing signal under the control of the controller for each folder casing position, antenna [impedance] position, and transmission and reception mode to vary an antenna impedance matching, and for causing the controller to measure the transmission level in the transmission mode and the reception sensitivity in the reception mode every time the antenna impedance matching is varied, and for providing a control signal for storing the optimal antenna impedance matching values;

a memory for storing the optimal antenna impedance matching values under the control of the CPU;

a digital-to-analog [convertor] converter for converting the voltage provided by the CPU into an analog voltage; and

a matching circuit for matching the impedance of the antenna and an impedance of the radio in response to the analog voltage.

20. A device as claimed in claim 18, wherein the matching circuit includes:

an inductor having a first end connected to the antenna and a second end connected to the transmission/reception circuit;

a first capacitor having a first end connected to the second end of the inductor and the transmission /reception circuit, and a second end grounded;

a second capacitor having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground; and

a variable capacitance diode having a first end connected to the antenna and the first [second] end of the inductor, and having a second end connected to ground,

wherein a capacitance of the variable capacitance diode is varied according to the analog voltage.

22. The portable radio terminal of claim 21 [1], wherein said impedance matching system further comprises:

a processor [receiving] which receives the sensing signal and [outputting] outputs a digital control signal in response [thereto] to whether the foldable casing is in the open position and whether the antenna is in the extended position; and

a digital to analog converter [receiving] which receives the digital control signal and [providing] provides a varactor tuning voltage in response thereto.

23. The portable radio terminal of claim 22 [2], wherein said processor comprises a memory [storing] which stores a predetermined digital value representing a varactor voltage value for matching said impedances, wherein said processor reads said digital value and outputs the digital control signal [in response thereto] corresponding to the sensing signal.

24. The portable radio terminal of claim 22 [2], wherein said processor comprises a memory comprising a plurality of memory locations, each location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances, wherein said processor reads one of said digital values in response to the sensing

signal and outputs the digital control signal [in response thereto] corresponding to the sensing signal.

25. The portable radio terminal of claim 24 [4], wherein said memory [comprises] includes [four] eight memory locations[,] comprising:

a first memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when [said] the antenna is extended, [and said] the foldable casing is open, and the portable radio terminal is receiving;

a second memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when [said] the antenna is [retracted] extended, [and said] the foldable casing is open, and the portable radio terminal is transmitting;

a third memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when [said] the antenna is extended; [and said] the foldable casing is closed, and the portable radio terminal is receiving; [and]

a fourth memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when [said] the antenna is [retracted] extended, [and said] the foldable casing is closed, and the portable radio terminal is transmitting;

a fifth memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when the antenna is retracted, the foldable casing is open, and the portable radio terminal is receiving;

a sixth memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when the antenna is retracted, the foldable casing is open, and the portable radio terminal is transmitting;

a seventh memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when the antenna is retracted, the foldable casing is closed, and the portable radio terminal is receiving; and

an eighth memory location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances when the antenna is retracted, the foldable casing is closed, and the portable radio terminal is transmitting.

26. The portable radio terminal of claim 21 [1], wherein said impedance matching circuit further comprises:

an inductor having a first end and a second end being connected in series between said antenna and said radio;

a first capacitor connected between said varactor and the first end of said inductor; and

a second capacitor connected between the second end of said inductor and a reference voltage.

27. The portable radio terminal of claim 26 [6], wherein said impedance matching system further comprises:

a processor receiving the sensing signal and outputting a digital control signal in response thereto; and

a digital to analog converter receiving the digital control signal and providing a varactor tuning voltage in response thereto.

28. The portable radio terminal of claim 27 [7], wherein said processor comprises a memory storing a predetermined digital value representing a varactor voltage value for matching said impedances, wherein said processor reads said digital value and outputs the digital control signal in response thereto.

29. The portable radio terminal of claim 27 [7], wherein said processor comprises a memory having a plurality of memory locations, each location storing a corresponding predetermined digital value representing a varactor voltage value for matching said impedances, wherein said processor reads one of said digital values in response to the sensing signal and whether the portable radio terminal is transmitting or receiving, and outputs the digital control signal in response thereto.

30. The portable radio terminal of claim 21 [1], wherein said impedance matching circuit further comprises:

an inductor having a first end and a second end being connected in series between said antenna and said radio;

a first capacitor connected between the first end of said inductor and a reference voltage; and

a second capacitor connected between the second end of said inductor and the reference voltage,

wherein the varactor is connected between the first end of said inductor and the reference voltage.

31. The portable radio terminal of claim 21 [1], wherein said sensing means includes a folder switch.

32. A portable radio terminal, comprising:

a radio having transmitting and receiving circuits;

[an antenna movable between a retracted position and an extended position;

a sensor for sensing whether said whether said antenna is in the extended position and for producing at least one sensing signal in response thereto; and]

a sensor for sensing whether the portable radio terminal is in transmit mode or receive mode and for producing at least one sensing signal indicating whether the portable radio terminal is in transmit mode or receive mode; and

an impedance matching system for matching an impedance of said antenna and an impedance of said radio, said impedance matching system receiving the sensing signal and including an impedance matching circuit having a varactor, the varactor having a varactor voltage which is changed in response to the sensing signal for tuning the impedance matching circuit based on whether the radio is transmitting or receiving.

33. The portable radio terminal of claim 32 [12], wherein said impedance matching system further comprises:

a processor [receiving] which receives the sensing signal and [outputting] outputs a digital control signal in response [thereto] to the sensing signal; and

a digital to analog converter [receiving] which receives the digital control signal and [providing] provides a varactor tuning voltage in response thereto.

34. The portable radio terminal of claim 33 [13], wherein said processor comprises a memory [storing] which stores a predetermined digital value representing a varactor voltage value for matching said impedances, wherein said processor reads said digital value and outputs the digital control signal in response thereto.

35. The portable radio terminal of claim 33 [13], wherein said impedance matching circuit further comprises:

an inductor having a first end and a second end being connected in series between said antenna and said radio;

a first capacitor connected between said varactor and the first end of said inductor; and

a second capacitor connected between the second end of said inductor and a reference voltage.

36. The portable radio terminal of claim 33 [13], wherein said impedance matching circuit further comprises:

an inductor having a first end and a second end being connected in series between said antenna and said radio;

a first capacitor connected between the first end of said inductor and a reference voltage; and

a second capacitor connected between the second end of said inductor and the reference voltage,

wherein the varactor is connected between the first end of said inductor and the reference voltage.

37. A method of producing a portable radio terminal which includes [comprising:] a radio having transmitting and receiving circuits[,]; a foldable casing enclosing said radio, said foldable casing movable between an open position and a folded position; an antenna movable between a retracted position into said foldable casing and an extended position extended from said foldable casing; means for sensing whether said foldable casing is in the open position and for sensing whether the antenna is in the extended position, and for providing at least one sensing signal in response thereto; and an impedance matching system for matching an impedance of said antenna and an impedance of said radio, said method comprising:

sensing whether said foldable casing is in the open position, [and] whether the antenna is in the extended position, and whether the portable radio terminal is transmitting or receiving;

determining an optimum varactor voltage value to match the impedances based on the position of the casing, the position of the antenna, and whether the portable radio terminal is transmitting or receiving; and

storing a digital value representing said optimum varactor voltage value in a memory location in said impedance matching system.

38. The method of claim 37 [17], wherein said determining and storing steps are performed when the portable radio terminal is in the states comprising:

[said] the antenna is extended, [and said] the foldable casing is open, and the portable radio terminal is receiving;

[when said] the antenna is [retracted] extended, [and said] the foldable casing is open, and the portable radio terminal is transmitting;

[when said] the antenna is extended, [and said] the foldable casing is closed, and the portable radio terminal is receiving;

[and when said] the antenna is [retracted] extended, [and said] the foldable casing is closed, and the portable radio terminal is transmitting;

the antenna is retracted, the foldable casing is open, and the portable radio terminal is receiving;

the antenna is retracted, the foldable casing is open, and the portable radio terminal is transmitting;

the antenna is retracted, the foldable casing is closed, and the portable radio terminal is receiving; and

the antenna is retracted, the foldable casing is closed, and the portable radio terminal is transmitting.